DEVELOPING A FRAMEWORK OF NON-FATAL OCCUPATIONAL INJURY SURVEILLANCE FOR RISK CONTROL IN PALM OIL MILLS

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I hereby declare that the work in this thesis is my own work except for the quotations and summaries which have been duly acknowledged

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For my late father, who will always be my foremost inspiration.

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ABSTRACT

Non-fatal occupational injury (NFOI) and its risk factors have become a current global concern. The need of research towards the relationship between occupational injury and its risk factor is essential, to fulfil the purpose and setting the priority of implementing safety preventive approaches at workplace. This research intended to develop a framework of NFOI surveillance by using epidemiological data, noise exposure data and NFOI data among palm oil mills' workers. A total of 420 respondents who assigned in operation and processing areas (OP) (n=333) and general or office workers (n=87) had voluntary participated in this research. A questionnaire session with respondents was held to obtain epidemiological data and NFOI information via validated questionnaire. Noise hazard monitoring was executed by using Sound Level Meter (SLM) for environmental noise monitoring and Personal Sound Dosimeter for personal noise monitoring. Gathered data were analysed in quantitative method by using statistical software IBM SPSS Statistic version 21 and a risk matrix table for injury risk rating evaluation. It was discovered that high noise exposure level (≥ 85 dB[A]) was significantly associated with non-fatal occupational injury among OP workers (φ=0.123, $p<0.05$) with OR=1.87 (95% CI, 1.080-3.235, $p<0.05$). Risk rating for reported NFOI was at moderate level, with minor cuts and scratches were the dominant type of injury (42.6%). Analysis of logistic regression indicated that working in shift, not wearing protective gloves, health problems such as shortness of breath and ringing in ears, and excessive noise level (≥ 85 dB[A]) were the risk factors of NFOI in palm oil mills among OP workers. A framework of non-fatal injury surveillance in palm oil mills was developed based on the findings with integration of risk management process and injury prevention principles. This framework is anticipated to help the management in decision making for preventive actions and early detection of occupational health effects among workers.

ABSTRAK

Kecederaan pekerjaan yang tidak membawa maut dan faktor risikonya menjadi kebimbangan serantau masakini. Keperluan untuk mengkaji perhubungan di antara kecederaan pekerjaan dan faktor risikonya adalah penting, dalam memenuhi tujuan dan memberi keutamaan dalam pelaksanaan keselamatan dan langkah pencegahan di tempat kerja. Kajian ini bertujuan untuk membina rangkakerja pengawasan kecederaan pekerjaan yang tidak membawa maut dengan menggunakan data epidemiologi, data pendedahan bunyi hingar dan data kecederaan pekerjaan yang tidak membawa maut di kalangan pekerja kilang sawit. Seramai 420 responden, iaitu pekerja yang ditugaskan di kawasan operasi dan pemprosesan (OP) (n=333) dan pekerja biasa atau pejabat (n=87) telah terlibat secara sukarela dalam kajian ini. Sesi soal-selidik bersama responden telah dijalankan untuk mendapatkan data epidemiologi dan maklumat kecederaan pekerjaan yang tidak membawa maut melalui borang soal-selidik yang telah disahkan. Pengukuran hazad bunyi hingar telah dilaksanakan dengan menggunakan *Sound Level Meter* (SLM) bagi pemantauan bunyi hingar persekitaran dan *Personal Sound Dosimeter* bagi pemantauan bunyi hingar perseorangan. Data yang diperolehi telah dianalisis melalui kaedah kuantitatif dengan menggunakan perisian statistik *IBM SPSS Statistic* versi 21 dan jadual risiko matrik bagi penilaian kadar risiko kecederaan. Pendedahan yang tinggi terhadap bunyi hingar (≥ 85 dB[A]) didapati mempunyai hubungan yang signifikan dengan kecederaan pekerjaan yang tidak membawa maut di kalangan pekerja OP (φ=0.123, $p<0.05$) dengan OR=1.87 (95% CI, 1.080-3.235, $p<0.05$). Kadar risiko kecederaan di tempat kerja telah direkodkan pada tahap sederhana, dengan kecederaan ringan dan calar adalah jenis kecederaan yang paling dominan (42.6%). Analisis regresi logistik menyatakan bahawa bekerja syif, tidak memakai sarung tangan keselamatan, masalah kesihatan seperti sesak nafas dan telinga berdengung, dan tahap bunyi hingar yang berlebihan (≥ 85 dB[A]) adalah faktor risiko kepada kecederaan pekerjaan yang tidak membawa maut di kalangan pekerja OP kilang sawit. Rangkakerja pengawasan kecederaan

pekerjaan yang tidak membawa maut di kilang sawit telah dibangunkan berpandukan hasil dapatan dengan menggabungkan proses pengurusan risiko dan prinsip-prinsip pencegahan kecederaan. Rangkakerja ini mampu membantu pihak pengurusan dalam membuat keputusan bagi tindakan pencegahan dan pengesanan awal kesan kesihatan pekerjaan di kalangan pekerja.

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LIST OF SYMBOLS AND ABBREVIATIONS

ILO	-	International Labour Organization
US	-	United States
BLS	-	Bureau of Labor Statistic
SOSCO	-	Social Security Organization
DOSH	-	Department of Safety and Health
GDP	-	Gross Domestic Product
EPU	-	Economic Planning Unit
MPOC	-	Malaysia Palm Oil Council
MPOB	-	Malaysia Palm Oil Board
FFB	-	Fresh Fruit Bunches
CPO	-	Crude Palm Oil
CPKO	-	Crude Palm Kernel Oil
RSPO	-	Roundtable for Sustainable Palm Oil
DOSM	-	Department of Statistic Malaysia
OSHMS	-	Occupational Safety & Health Management System
ILO-OSH	-	International Labour Organization-Occupational Safety & Health
BS: OHSAS	-	British Standard: Occupational Health & Safety Assessment Series
NKEA	-	National Key Economics Areas
ETP	-	Economic Transformation Programme
H_a	-	Alternative Hypothesis
MPOA	-	Malaysian Palm Oil Association
PKO	-	Palm kernel oil
R&D	-	Research & Development
FFA	-	Free Fatty Acids
EFB	-	Empty fruit bunches

POME	-	Palm Oil Mill Effluent
SOP	-	Standard Operation Procedure
HIRARC	-	Hazard Identification, Risk Assessment & Risk Control
WoS	-	Web of Science
sAA	-	salivary Alpha Amylase
WBGT	-	Wet Bulb Globe Thermometer
ACGIH	-	American Conference of Governmental Industrial Hygienists
WHO	-	World Health Organization
DALY	-	Disability Adjusted Life Year
NFOI	-	Non-Fatal Occupational Injury
FMA	-	Factories and Machinery Act
MPOA	-	Malaysia Palm Oil Association
RBD	-	Refined, Bleached and Deodorised
PKE	-	Palm Kernel Expeller
EFB	-	Empty Fruit Bunch
OER	-	Oil Extraction Rate
dB	-	decibel
dB[A]	-	A-weighted decibel
EASHW	-	European Agency for Safety and Health at Work
OSHA	-	Occupational Safety and Health Act
US OSHA	-	United States of Occupational Safety and Health Administration
CMID	-	Core Minimal Injury Dataset
OCID	-	Optional Core Injury Dataset
L_i	-	Likelihood
O_i	-	Outcome
HAZOP	-	Hazard and Operability study
FMEA	-	Failure Modes Effects Analysis
SWOT	-	Strengths, Weaknesses, Opportunities and Threats
PESTLE	-	Political, Economic, Social, Technological, Legal and Environmental
ISO	-	International Organisation of Standardization
OP	-	Operational & Processing worker
Off.	-	General or Office worker

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